

REMARKS

Claims 1-2, 4-7, 18, 20, 24, 26 and 28-29 were examined. No claims are amended.
Claims 1-2, 4-7, 18, 20, 24, 26 and 28-29 remain in the application.

The Patent Office rejects claims 1-2, 7, 18, 20, 24 and 26 under 35 U.S.C. § 102(e). The Patent Office rejects claims 1-2, 4-7, 18, 20, 24, 26 and 28-29 are rejected under 35 U.S.C. § 103(a). Reconsideration of the pending claims is respectfully requested in view the following remarks.

A. 35 U.S.C. § 102(e): Rejection of claims 1-2, 7, 18, 20, 24 & 26

The Patent Office rejects claims 1-2, 7, 18, 20, 24 and 26 under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,869,879 of Ryan (Ryan). The Patent Office fails to note any method described in Ryan.

Independent claim 1 describes a method including introducing an etch stop layer on a substrate; introducing a base layer on the etch stop layer; and introducing a dielectric cap layer on the base layer between an interconnection line and a contact point on the substrate. According to claim 1, the dielectric cap layer comprises alternating different material layers, wherein each respective layer of the alternating different material layers is selectively etchable with respect to the etch stop layer and the number of occurrences of each material layer is greater than one.

Independent claim 1 is not anticipated by Ryan, because Ryan does not describe a dielectric cap layer comprising alternating different material layers wherein the number of occurrences of each different material layer is greater than one.

Claims 2, 7, 18, 20, 24 and 26 depend from claim 1 and therefore contain all limitations of that claim. For at least the reason stated with respect to claim 1, claims 2, 7, 18, 20, 24 and 26 are not anticipated by Ryan.

Applicant respectfully requests that the Patent Office withdraw the rejections to claims 1-2, 7, 18, 20, 24 and 26 under 35 U.S.C. § 102(e).

B. 35 U.S.C. § 103(a): Rejection of claims 1-2, 4-7, 18, 20, 24, 26 and 28-29

The Patent Office rejects claims 1-2, 4-7, 18, 20, 24, 26 and 28-29 under 35 U.S.C. § 103(a) as obvious over Ryan in view of U.S. Patent No. 6,475,925 of Braeckelmann et al. (Braeckelmann). Braeckelmann is cited for teaching repetition of capping layers for the formation of a multi-level interconnect with respect to Figures 5-6.

Applicants disagree for these reasons that independent claim 1 requires a dielectric cap layer comprising alternating different material layers that are each etchable with respect to the etch stop layer and where the number of occurrences of each different material layer is greater than one.

Braeckelmann teaches interlayer dielectric (ILD) 210 and 510 each having three layers, 204/206/208 and 504/506/508 (see Figure 5 and 6). However, these tri layer inter level dielectric (ILD) films do not teach, suggest, or motivate, a plurality of alternating material layers because the triple layer ILDs have etch stop layers between them (e.g., layers 502 and 202 of Figures 5 and 6), and thus, are not alternating layers of different material as required by claim 1. In addition, layers 204 or 504 and 208 or 508 are the same material (see col. 2, lines 50-67), and thus the sequence is 1, 2, 1, 1, 2, 1, ... On the other hand, for example, without limitation thereto, as shown in the figures and described in the text of Applicants' specification, alternating layers may be two or more layers of material that alternate in sequence such as 1, 2, 1, 2, 1, 2... or 1, 2, 3, 1, 2, 3.... Hence, Applicants respectfully request the Patent Office withdraw the objections above.

Independent claim 28 describes a method including forming a planarized base layer over a substrate having a plurality of devices and forming a dielectric cap layer over the base layer. The dielectric cap layer is formed by alternating a first material layer and a second material layer a plurality of times, the second material layer formed of a material having a higher dielectric constant than a dielectric constant of a material of the first material layer. Collectively, the plurality of the first material layers is more than five times thicker than the plurality of second material layers.

Claim 28 is not obvious over the cited references, because the cited references do not teach or provide any motivation for forming a dielectric cap layer by alternating a first material layer and a second material layer a plurality of times and wherein collectively the plurality of first material layers is more than five times thicker than the plurality of second layers. The discussion above with respect to claim 1 and the cited references is relevant here.

Any depending claims not mentioned above are submitted as not being anticipated or obvious for list for the same reasons given above in support of the base claims.

C. 35 U.S.C. § 103(a): Rejection of claims 1-7, 18, 20, 24, 26 & 28-29

The Patent Office rejects claims 1-7, 18, 20, 24, 26 and 28-29 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6, 350,700 of Schinella et al. (Schinella) in view of U.S. Patent No. 6,127,089 of Subramanian et al. (Subramanian).

Schinella is cited for describing a method including introducing an etch stop layer 16, introducing a base layer 20 over the etch stop layer, introducing a dielectric cap layer 26 followed by a hard mask layer 30 and ARC layer 38.

Subramanian teaches cap layer 44 that may be a thick layer of TEOS or a multiple layer cap (Column 1, lines 52-53). An example of the multi-layer cap layer 44 is a 2,000 Å thick TEOS layer, a 1,000 Å nitride middle layer and a 800 Å thick top layer that is an organic bottom anti-reflective coating (Column 1, lines 53-57).

Independent claim 1 is not obvious over the cited references, because the cited references do not describe or provide any motivation for a dielectric cap layer comprising alternating different material layers where the number of occurrences of each different material layer is greater than one. As noted above with respect to Subramanian, the three materials that make up the multiple layer cap layer 44 do not include occurrences greater than one of any material. Further, there is no motivation from Subramanian or Schinella to form such a multiple occurrence of an alternating multiple layer cap layer.

Also, U.S. Patent number 6,383,950 to Pangrle et al. (Pangrle) is cited for teaching multiple layers with difference functions of materials (see Col. 1, Lines 55-67; Col. 2, Lines 1-5;

Col. 4, Lines 39-47). However, the cited sections of Pangrle only teach a single set of multiple layers, but do not teach alternating different material layers with a number of occurrences is greater than one, as required by claim 1.

Next, the Patent Office cites U.S. Patent Number 65,625,442 of Cheung et al. (Cheung) for teaching a silicon oxide part of the capping layer to be over an ARC layer as the alternate layer (see layer 240 over ARC layer 210; and Col. 4, Line 53-55). However, the Patent Office has not identified the Applicants are unable to find any teaching or suggestion in Cheung of more than one occurrence of alternating different material layers, as required by claim 1.

Hence, as none of the cited references individually, or in combination teach, suggest, or motivate the above noted limitations of claim 1, Applicants respectfully request that the Patent Office withdraw rejection of claim 1 above.

Claims 2-7, 18, 20, 24 and 26 depend from claim 1 and therefore contain all the limitations of that claim. For at least the reasons stated with respect to claim 1, claims 2-7, 18, 20, 24 and 26 are not obvious over the cited references.

Independent claim 28 is not obvious over the cited references, because the cited references do not describe or provide any motivation for a dielectric cap layer formed by alternating a first material layer and a second material layer a plurality of times. In this regard, the comments made with respect to the references in claim 1 are relevant here.

Claim 29 is dependent from claim 28 and therefore contains all the limitations of that claim. For at least the reason stated with respect to claim 28, claim 29 is not obvious over the cited references.

Applicant respectfully requests that the Patent Office withdraw the rejection to claims 1-7, 18, 20, 24, 26 and 28-29 under 35 U.S.C § 103(a).

D. 35 U.S.C § 103(a): Rejection of claims 1-7, 18, 20, 24, 26 & 28-29

The Patent Office rejects claims 1-7, 18, 20, 24 26 and 28-29 under 35 U.S.C § 103(a) as obvious over Braeckelmann in view of Subramanian.

Claims 1-7, 18, 20, 24 and 26 are not obvious over the cited references, because, as noted above, neither Braeckelmann nor Subramanian describe, teach, or provide any motivation for forming a cap layer of alternating different material layers wherein the number of occurrences of each different material layer is greater than one. Each of Braeckelmann and Subramanian teach multiple layer materials, but the multiple layers do not include alternating different material layers wherein the number of occurrences of each alternating different material layer is greater than one.

Similarly, claims 28-29 require a dielectric cap layer including a first material layer and second material layer alternated a plurality of times. Thus, claims 28-29 are not obvious over the cited references because, as noted with respect to claim 1, the cited references do not teach or provide any motivation for a dielectric cap layer including a first material layer and second material layer alternated a plurality of times.

Applicant respectfully requests that the Patent Office withdraw the rejection of claims 1-7, 18, 20, 24, 26 and 28-28 under 35 U.S.C § 103(a).

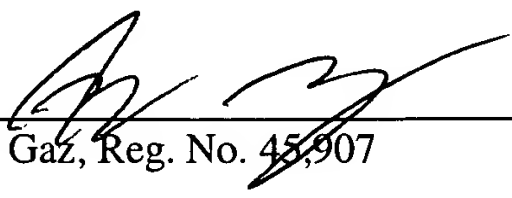
CONCLUSION

In view of the foregoing, it is believed that all claims now pending patentably define the subject invention over the prior art of record and are in condition for allowance and such action is earnestly solicited at the earliest possible date.

Respectfully submitted,

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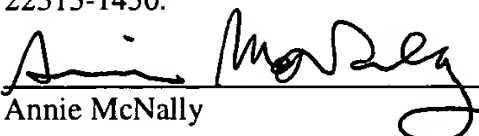


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